



Tanta University

Electrical Power and Machines Engineering Department



Faculty of Engineering

ELECTRICAL POWER SYSTEM (1)

EXPERIMENTS

FOR 2ND YEAR STUDENT

2017

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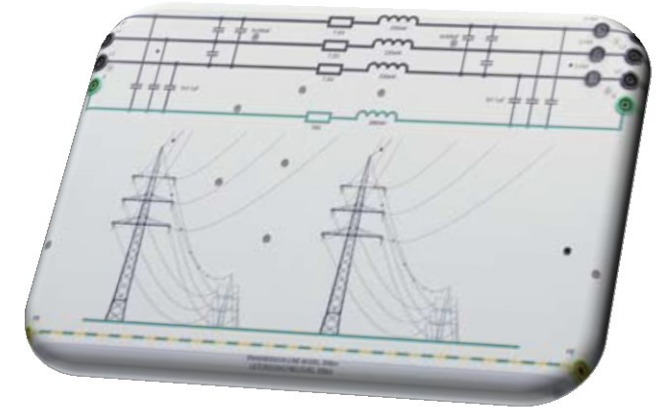
Theory is when You know every thing but nothing work.

Practical is when every thing works but no one know why.

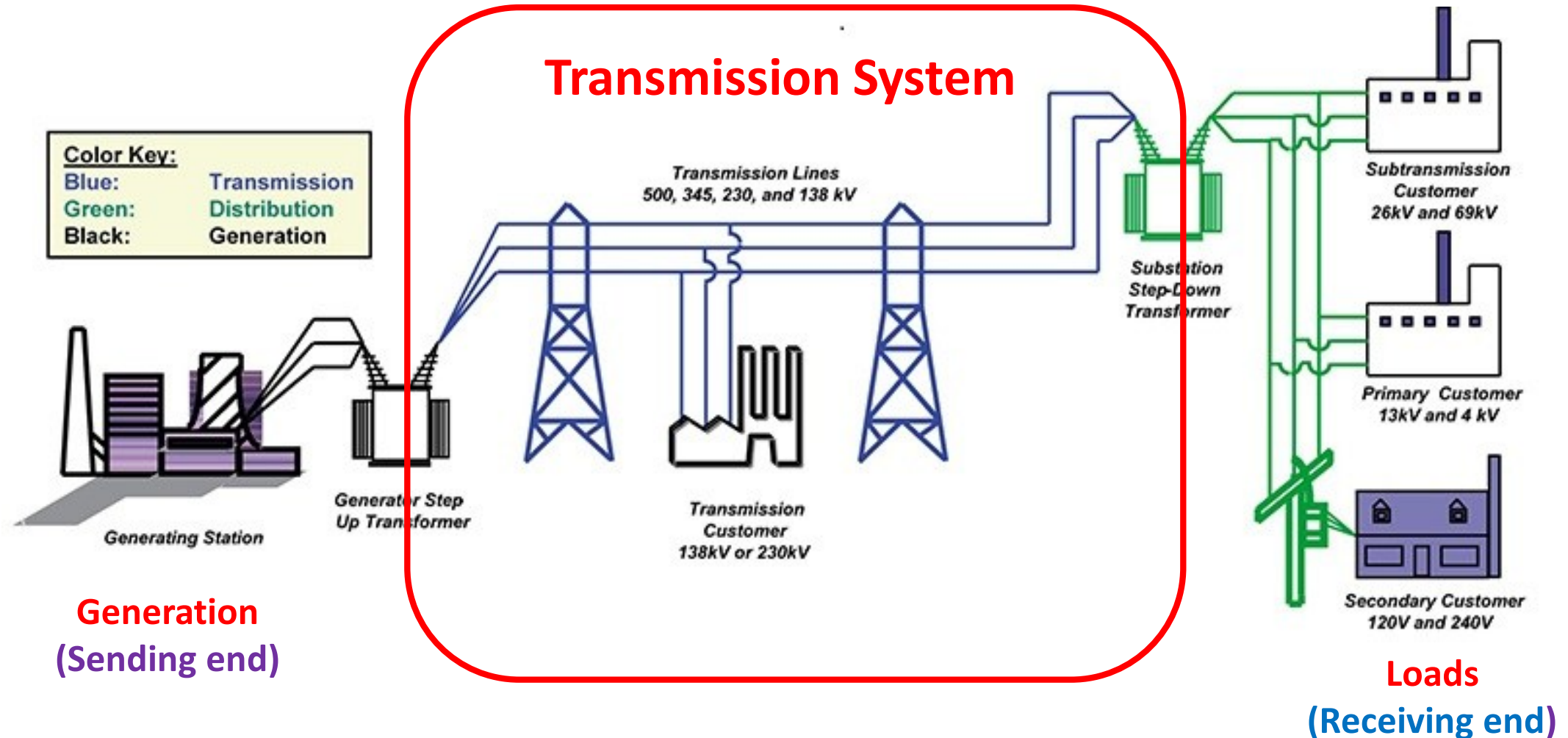
In our Lap, theory and practical are combined: relatively,
You know every thing and every thing works, ISA.

CONTENTS

1. **Performance of short transmission lines**
2. Determination of short transmission line model constants
3. Performance of Medium Transmission Lines (T-Model)
4. Performance of Medium Transmission Lines (π -Model)
5. Determination of the Dc Distributor Performance
6. Potential Distribution Over a String of Suspension Insulators



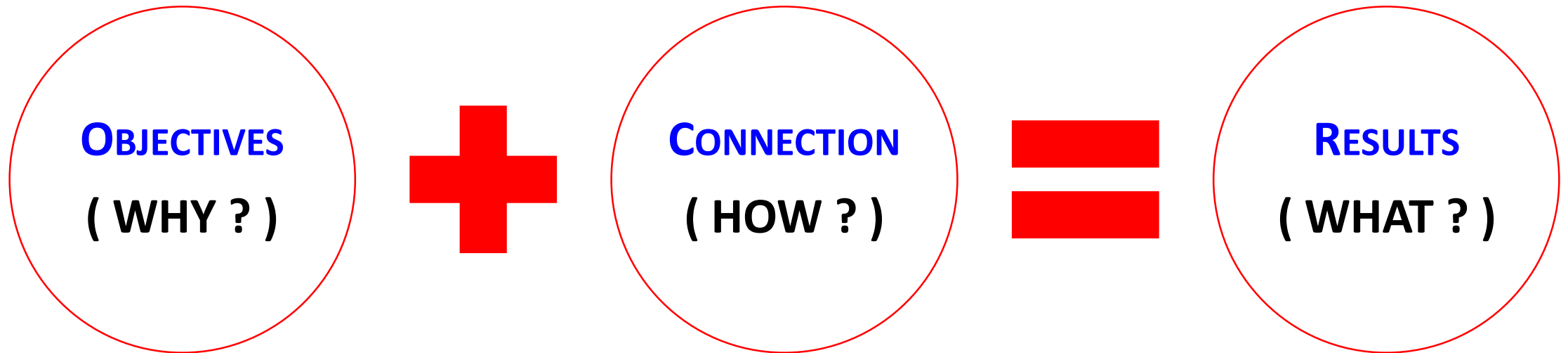
POWER SYSTEM STRUCTURE



TRANSMISSION LINES



OUTLINES



EXP (1)

Performance of short transmission lines

< 80 km + Up to 20 kV

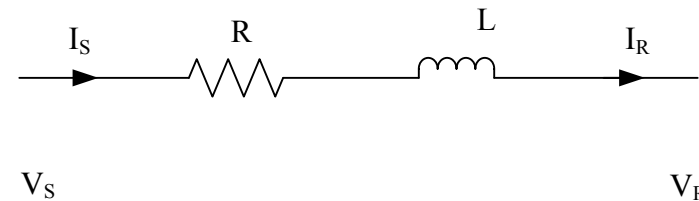
OBJECTIVES

TL resistance (R) and reactance (X)

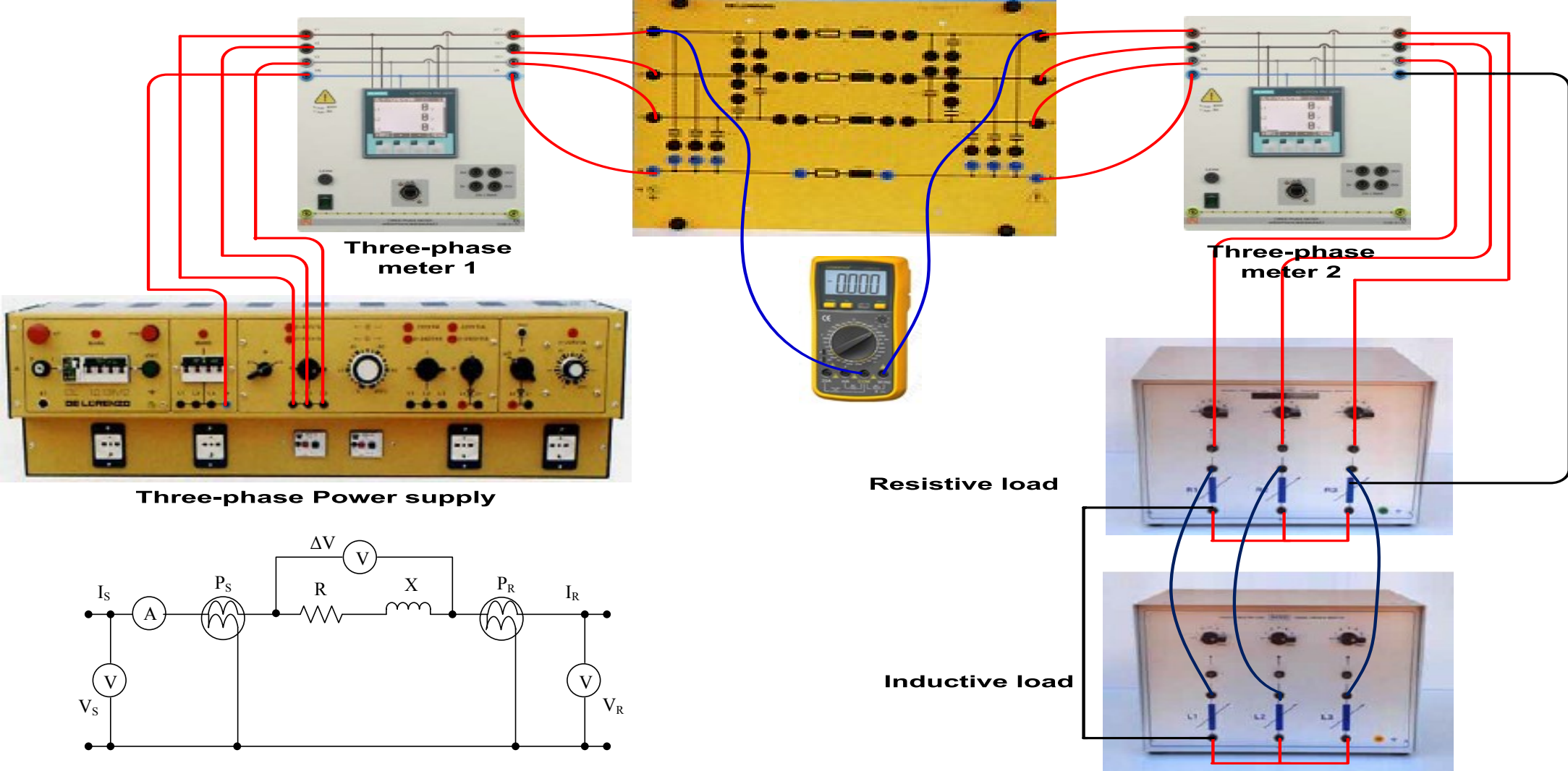
C/Cs of the short TL

Plot the phasor diagram at lag, unity, and lead power factors

Short TL (< 50 mile, 80 km)



CONNECTION DIAGRAM



RESULTS

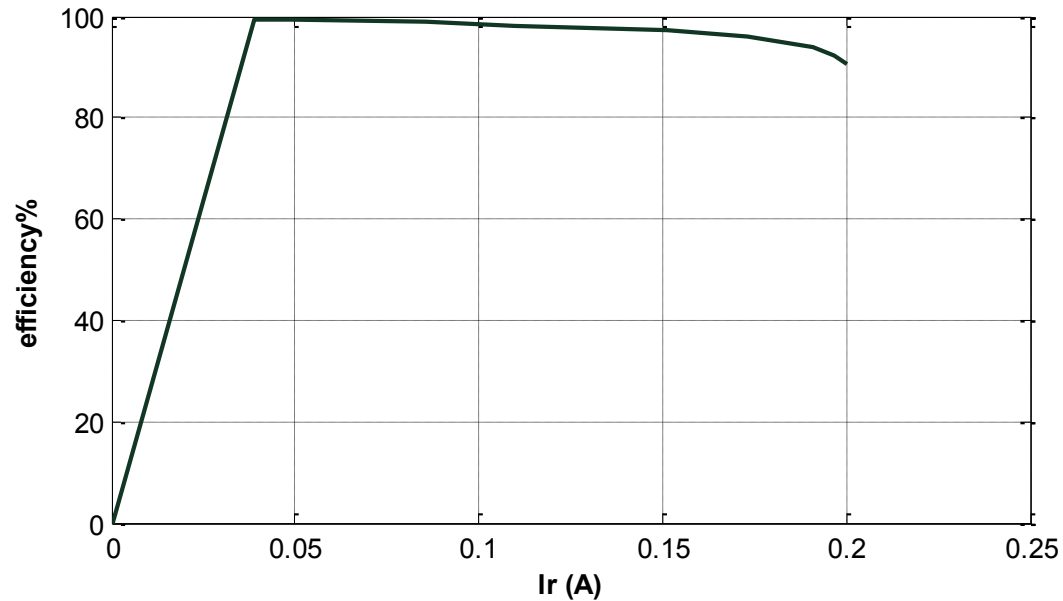
R	V _s	I _r	V _r	P _r	P _s	ΔV	$\zeta\%$	$\varepsilon\%$	R	Z	X_L
0			80 V			?	?	?	?	?	?
1			80								
2			80								
3											
4											
5											

Repeat for **Unity**
and **lead PF**



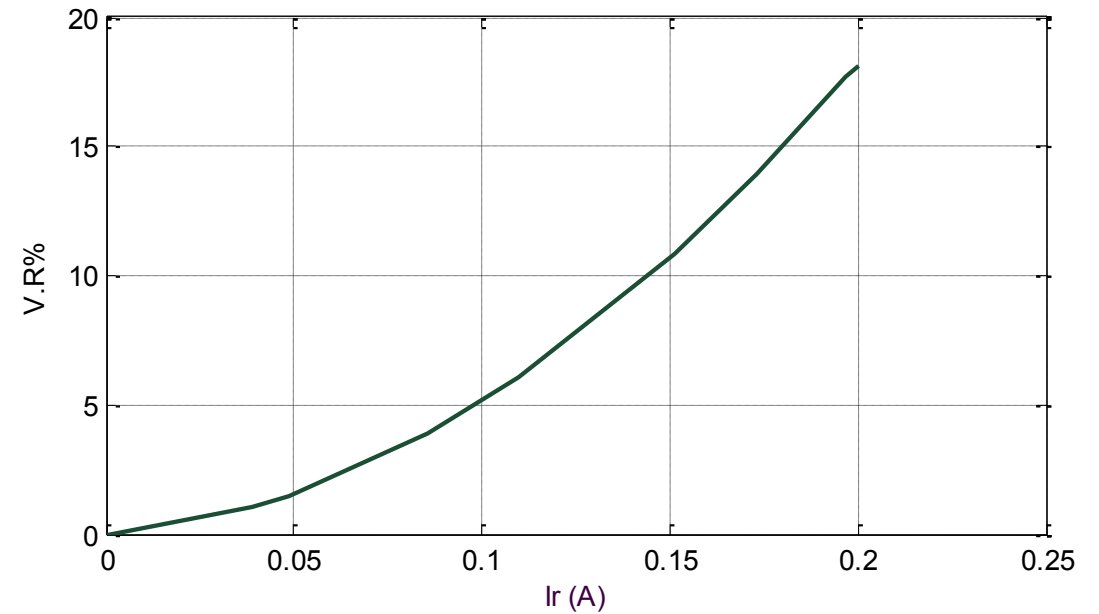
R_{av} & X_{av} ??

RESULTS (ACTUAL)



Efficiency % and load current (Short TL)

$$\% \text{ efficiency } (\mu) = \frac{\text{Power received at receiving end}}{\text{Power delivered at sending end}} \times 100 \%$$



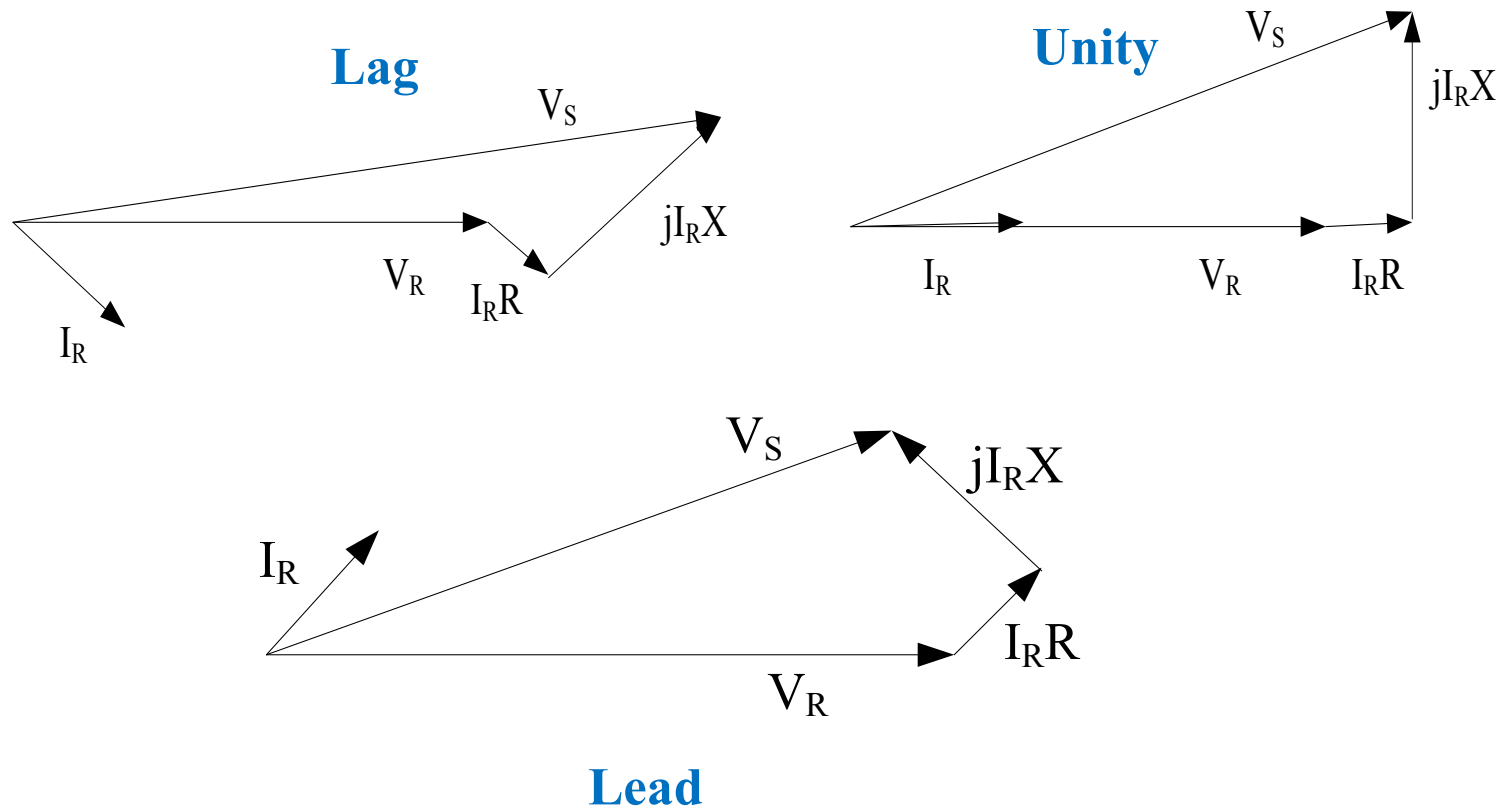
Voltage regulation % and load current (Short TL)

$$\% \text{ regulation} = \frac{V_s - V_r}{V_r} \times 100 \%$$

NOTES

✓ The phasor diagram of short TL at lag, unity and lead power factors

✓ R & X_L calculations



$$|Z| = \frac{|\Delta V|}{|I|}$$

$$P_{loss} = P_s - P_R$$

$$R = \frac{P_{loss}}{I}$$

$$X_L = \sqrt{Z^2 - R^2}$$

DISCUSSION

1. What is the justification in neglecting line capacitance in short transmission lines?
2. What is the effect of load power factor on voltage regulation and efficiency of short transmission lines?

RESULTS

WHAT DO THE MEASUREMENT RESULTS INDICATE ? !

Comments !!



EXP.1 RESULTS (WITH R-L LOAD)

R (position)	V_s V	I_r mA	I_s mA	V_r V	P_r W	P_s W	ΔV V
0 (Open Circuit)	100.7	0.00	0.00	100	0.00	0.00	0.031
1	103.2	96.5	96.5 mA	100	9.30	9.60	8.6
2	106.5	186.5	186.5	100	17.40	18.40	17.1
3	110	269.0	269.0	100	24.20	26.00	25.0
4	113.8	347.0	347.0	100	29.90	32.70	32.7
5	117.5	414.0	414.0	100	34.20	38.00	39

THANKS